

SFGate.comwww.sfgate.com[Return to regular view](#)

Mapping of cosmos backs Big Bang theory Birth of time revealed in world according to WMAP

[Keay Davidson, Chronicle Science Writer](#)

Wednesday, February 12, 2003

[©2003 San Francisco Chronicle](#) | [Feedback](#)URL: <http://sfgate.com/cgi-bin/article.cgi?f=/c/a/2003/02/12/MN15416.DTL&type=science>

NASA astronomers have unveiled history's best-ever "baby picture" of the universe -- the most accurate, detailed snapshot of the cosmos close to the beginning of time.

The stunning achievement helps answer many questions that have taunted cosmologists, including the age and ultimate fate of the universe.

The image, recorded by a NASA satellite in deep space some 1 million miles from Earth and announced Tuesday at a press conference, shows the cosmic microwave radiation, the foggy afterglow that pervaded the cosmos 380,000 years after the Big Bang.

Ripples in the radiation mark primordial building blocks of "superclusters" -- immense clouds, chains and sheets of galaxies that crisscross today's universe like gossamer superhighways, National Aeronautics and Space Administration scientists announced.

By analyzing the ripples, scientists have concluded the cosmos is 13.7 billion years old; that it will expand forever until it dissipates like a cloud; that it consists mostly of mysterious "dark matter" and "dark energy," and that the first stars began forming much sooner than originally thought.

NASA called the achievement by the Wilkinson Microwave Anisotropy Probe, or WMAP, "one of the most important scientific results of recent years." Its data "lay the foundation for a unified and coherent cosmic theory," said WMAP principal investigator Charles Bennett at the press conference.

13.7 BILLION YEARS OLD

The WMAP satellite data is helping scientists answer many key questions:

-- Three decades ago, astronomers debated whether the universe had always existed or began with the Big Bang. The new pictures confirm the reality and certain details of the Big Bang and reveal the age of the cosmos as 13.7 billion years, roughly three times as old as Earth itself.

-- To their surprise, scientists have concluded based on WMAP images that the earliest stars formed only 200 million years after the Big Bang. That's several hundred million years earlier than originally thought, NASA said at the press conference at Goddard Space Flight Center in Greenbelt, Md.

-- Thanks to the WMAP images, scientists conclude that only 4 percent of the cosmos consists of matter as we know it. The rest of the universe is so-called "dark matter" and "dark energy," about which virtually nothing is known.

"We live in an implausible, crazy universe," said one of the grand old men of American cosmology, astrophysicist John Bahcall of the Institute for Advanced Study in Princeton, N.J. He wasn't a member of the WMAP team but participated in the NASA press conference.

"Every astronomer will remember the moment he heard the results from WMAP," Bahcall said. He acknowledged that he had previously questioned the idea that the universe is pervaded by an invisible "dark energy" that is causing the cosmos to expand faster with time. But the WMAP data has changed his mind.

WMAP is a joint project of NASA and Princeton University. It is named after David Wilkinson, a Princeton cosmologist and WMAP researcher who died in September. Other team members came from UCLA, the University of Chicago, Brown University, and the University of British Columbia in Vancouver.

In June 2001, NASA launched the 16-foot-long, 1,800-pound WMAP to its present location a million miles from Earth, four times the distance to the moon.

Over 12 months, WMAP's sensors scanned the entire sky. They recorded the extremely faint "cosmic background radiation" or CBR, which is microwave radiation that pours from all directions of the sky. First detected in the mid- 1960s, CBR is the afterglow of the Big Bang.

During those 12 months, WMAP was, in effect, taking a yearlong "time exposure" of the CBR. The feat is "the equivalent of taking a picture of an 80- year-old person on the day of their birth," says a NASA summary of WMAP findings.

Most important is WMAP's mapping of "ripples" in the CBR with unprecedented precision.

DISCOVERING RIPPLES

When first discovered in the 1960s, the CBR displayed seemingly uniform intensity in all directions of the sky. That uniformity puzzled astronomers. It appeared too "smooth" to explain how gravity could have tugged together matter fast enough to form galaxies and superclusters of galaxies since the Big Bang.

The mystery began to clear up in 1992, when another satellite, NASA's Cosmic Background Explorer, or COBE, revealed subtle nonuniformities, or ripples, in the background radiation.

WMAP's observations provide a far higher-resolution "map" of the cosmic background radiation. So high, in fact, that it reveals ghostly "structures" as small as a few hundred thousand light-years across, roughly the size of the larger galaxies. (A light-year is 6 trillion miles, the distance light travels in a year.)

E-mail Keay Davidson at kdavidson@sfgchronicle.com.

[©2003 San Francisco Chronicle](#) | [Feedback](#)